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Sleep and Sadness: Exploring the Relation Among Sleep Quality, Cognitive Control, and Depression

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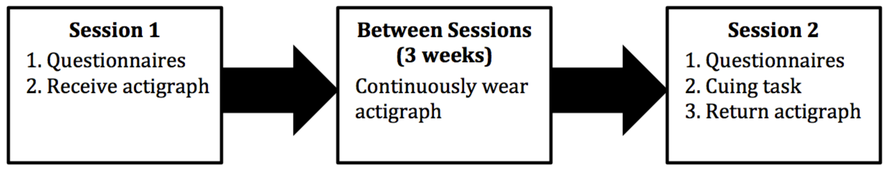
Introduction

- Sleep disturbance is a common feature of depression.[1] Moreover, Chen, Burley, and Gotlib[2] found that depression-vulnerable people, compared to their low-risk counterparts, report poorer sleep quality, suggesting sleep difficulties may precede the disorder.
- Both sleep disruption and depression have been linked to biased cognition and deficits in cognitive control.[3,4]
- The current study sought to investigate the underlying mechanisms by which sleep difficulties may contribute to depression symptomology.
- Hypotheses:
  1. Poorer sleep quality predicts increases in depression symptoms. We also explored the relationship between objective measures and depression.
  2. Cognitive control over emotional information mediates the relation between sleep disturbance and changes in depression.

Methods

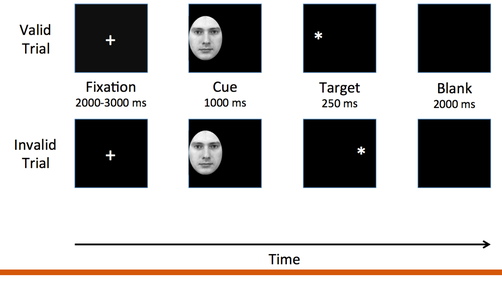
Participants:
- 35 undergraduate students (14 women, 21 men)
- Ages ranged from 18-23 years old (*M* = 19.83, *SD* = 1.25)

Questionnaires:
- Center for Epidemiologic Studies Depression Scale (CES-D) 20-item self-report measure of current depressive symptoms
- Pittsburgh Sleep Quality Index (PSQI) 19-item self-report measure of sleep quality and disturbances across the past month



Cognitive Control (Emotional Cuing Task)

- 192 trials (128 valid cue trials; 64 invalid cue trials)
- Calculated cue validity score for each individual
- CV = Mean RT (invalid trials) – Mean RT (valid trials)
- Greater CV scores indicate greater difficulty disengaging attention



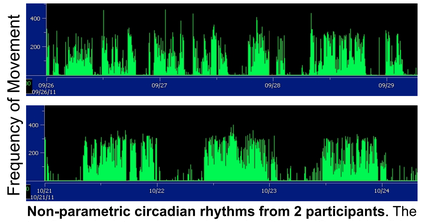
Actigraphy

- Participants wore a Motionlogger Actigraph continuously for 3 weeks
- We calculated two non-parametric circadian rhythm variables and two standard measures (average sleep duration and daily sleep variability)
- We used automatic scoring using the Cole-Kripke algorithm to calculate sleep variables

Circadian Rhythm Variables:

Interdaily stability (IS)
- Stability of rhythm between days
- Ranges from 0 to 1 where higher values indicate greater stability

Intradaily variability (IV)
- The period of rest and activity that is fragmented
- Ranges from 0 to 2 where higher values indicate more fragmented rhythms



Non-parametric circadian rhythms from 2 participants. The top figure depicts a sleep-wake cycle with low IS and high IV. The bottom depicts a sleep-wake cycle with high IS and low IV.

Results

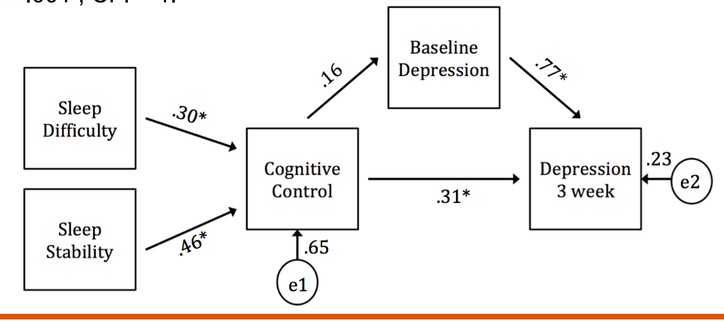
Sleep and Depression

1. Sleep quality was moderately correlated with depressive symptoms at session 2.
2. Sleep variability, stability (IS) and fragmentation (IV) were not associated with depressive symptoms.
3. Average sleep duration was associated with session 2 depressive symptoms but fell short of significance (p = .08).

	1.	2.	3.	4.	5.	6.	7.	8.
1. CESD-T1								
2. CESD-T2	.78*							
3. PSQI-G	.32	.43*						
4. CV (msec)	.24	.53*	.41*					
5. IS	-.00	.20	.14	.46*				
6. IV	.12	-.04	-.20	-.30	-.67*			
7. Sleep duration	.19	.29	.04	.08	.30	-.25		
8. Sleep variability	.18	-.02	.05	-.23	-.51*	.44*	-.16	
Mean	13.34	12.43	5.37	17.04	0.55	0.50	7.16	1.94
SD	8.75	7.71	1.78	34.27	0.13	0.08	0.79	0.51

Path Model

Path analysis was used to test whether sleep quality and stability contribute to altered cognitive control over negative stimuli, which in turn predicts change in depression symptoms. This model provided good fit to the data X^2 (df = 2) = 67.74, p < .001 , RMSEA < .001 , CFI = 1.



Conclusions

- Poorer sleep quality was associated with increases in depression symptoms. This finding supports Chen and colleagues[2] suggesting that sleep disturbance is not solely a by-product of the depression but, instead, may precede the disorder.
- Sleep quality predicted cognitive control over negative stimuli which, in turn, predicted changes in depression symptoms. Thus, sleep may contribute to depression via its impact on cognition, particularly cognitive control over emotional information.
- Limitations of the current study include small sample size and the cross sectional nature of tested associations (e.g., cognitive control and depression symptoms).

References

[1]Benca, R. M., Obermeyer, W. H., Thisted, R. A., & Gillin, J. C. (1992). Sleep and psychiatric disorders: A meta-analysis. *Archives of General Psychiatry*, *49*, 651-668.
[2]Chen, M. C., Burley, H. W., & Gotlib, I. H. (2012). Reduced sleep quality in healthy girls at risk for depression. *Journal of Sleep Research*, *21*, 68-72.
[3]Daniela, T., Alessandro, C., Giuseppe, C., et al. (2010). Lack of sleep affects the evaluation of emotional stimuli. *Brain Research Bulletin*, *82*, 104-108.
[4]Gotlib, I. H., Krasnoperova, E., Yue, D. N., & Joormann, J. (2004). Attentional biases for negative interpersonal stimuli in clinical depression. *Journal of Abnormal Psychology*, *113*, 127-135.